arterial stenoses can be shown well, although typically they are overgraded. Magnetic resonance angiography examinations can be used to show the whole length of the carotid and vertebral vessels from their origins in the neck to their intracranial branches. Occlusive lesions of the intracranial arteries may also be identified, provided the vessels are of sufficient caliber and the intracranial vasculature is depicted.

Magnetic resonance angiography is ideal for placing an arterial occlusive lesion into one of three diagnostic groups—normal; minor stenosis of a vessel not impeding flow; or severe flow-limiting stenosis. These categories will indicate whether or not a patient needs to undergo conventional angiography or whether medical treatment is indicated.

Carotid ulcerations may not be detected with MRA because the relative stasis of blood within these lesions fails to produce adequate blood flow contrast. In such cases, duplex sonography of the carotid bifurcation can be useful. On the other hand, MRA can show the whole length of the internal carotid artery, which sonography is generally unable to do because of the mandible and skull base. Another pitfall of MRA relates to the overgrading of vascular stenoses. This error is produced by the presence of turbulent flow distal to the stenoses, which results in signal loss caused by dephasing.

The current application of MRA in intracranial aneurysms is limited to certain clinical situations such as evaluating patients with severe pulsating headaches or ocular migraine headaches. Magnetic resonance angiography can be used as a noninvasive screening examination in patients with a family history of or a phobia about aneurysms. Patients with subarachnoid hemorrhage must undergo a conventional angiogram. Magnetic resonance angiography has proven to be a good method of detecting and characterizing intracranial arteriovenous malformations. A variety of techniques have been used to delineate the nidus and major feeding vessels of these malformations.

Displacement or compression of vessels is another use of MRA in evaluating patients with intracranial tumors. The direction of displacement of a vessel can aid in deciding the proper surgical approach and in anticipating the structures as they are surgically identified. A neoplasm encasing a vascular structure can also be clearly depicted. Such encasement may involve either an arterial structure or the cortical veins and dural sinuses.

Magnetic resonance angiography is a useful technique for providing information about the intra- and extracranial carotid and vertebrobasilar circulations. When used in conjunction with the history and clinical findings, it can help physicians diagnose and treat patients with occlusive vascular diseases. Magnetic resonance angiography cannot substitute for conventional angiography in all cases and is not generally indicated in patients with subarachnoid hemorrhage.

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Intraoperative Radiotherapy

IN CLINICAL RADIOTHERAPY, higher doses of radiation increase the probability of tumor cure at the expense of normal tissue. Intraoperative radiotherapy offers a means to irradiate the tumor selectively, thus improving the therapeutic ratio. Intraoperative radiotherapy allows more precise localization of the target volume under direct vision while protecting normal tissue by manual displacement or shielding. Intraoperative radiotherapy also takes advantage of the increased biologic effect of a large single dose of radiation.

Typically, following diagnosis and staging by a multidisciplinary team, patients receive a moderate dose preoperatively of external beam irradiation (45 to 50 gray for 4½ weeks to 5 weeks) to a relatively large area, including the tumor and regions of suspected subclinical extension. After a break of about four weeks, the tumor is resected, if possible, and intestinal or biliary bypasses are done, if needed. At this point, the surgeon and radiation oncologist jointly determine the areas at greatest risk for recurrence, and those areas receive a single large fraction (10 gray to 20 gray) of intraoperative radiotherapy. The patient can be treated under anesthetic either in the operating room or the radiation therapy department.

The most promising uses for intraoperative radiotherapy are in gastric and rectal cancer. Data from studies in Japan indicate improvement in survival rates following surgical procedures and intraoperative radiotherapy in gastric tumors, compared with resection alone. The benefit is greatest in higher stage tumors. Data from this country show improved local control and survival in initially unresectable rectal carcinomas when intraoperative radiotherapy is added to preoperative irradiation and resection. Other sites where this therapy has shown promise include retroperitoneal sarcomas, mediastinal tumors, and biliary tumors. Toxicity has been minimal, and extensive data from studies in large animals detail the sensitivities of a wide range of tissues and organs to single large radiation fractions.

Intraoperative radiotherapy offers the possibility of improved local tumor control, which may increase the probability of tumor cure.

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Infections in Emergency Medicine—Newer Imaging Strategies

INFECTIONS ARE A COMMON PROBLEM in emergency medicine. Newer imaging methods may expand the role of emergency radiology in the preliminary evaluation of some infectious and inflammatory processes.

Acute sinusitis can be evaluated with a limited sinus computed tomographic (CT) scan using 5 mm axial sections without contrast—one through the frontal sinuses, a second through the sphenoid-ethmoid level, and two through the maxillary sinuses. Sinus opacification, air-fluid levels, osse-